

and sciences, learned and polite, commenced in this country. Every thing which contributes to the comfort and prosperity of a nation moved forward in improvement so rapidly and so obviously, as to mark that period with particular distinction. Manufactures were also extended on a new plan, by the enterprise, the capital, and, above all, by the science of men of deep knowledge and persevering industry, engaged in them. All this produced a new demand, not thought of till then in this country,—*internal navigation*; to make communications between factory and factory, and from warehouses to harbours, as well as to carry raw materials, became absolutely necessary. Hence arose those wonderful works, not of pompous and useless magnificence, but of real utility, which are carrying on to an extent and magnitude to which, as yet, there is no appearance of limitation. This general situation of things gave rise to a new profession called *civil-engineering*. In all the polished nations of Europe it had previously existed; in this country, however, the formation of such artists has been left to chance, and persons leaned towards the public call of employment, in this way, at their natural turn of mind took a bias. The civil engineers of Britain are therefore a self-created set of men, whose profession owes its origin not to power or influence, but to the best of all protection, the encouragement of a great and powerful nation, a nation become so from the industry of its manufacturing workmen, and their superior knowledge in practical chemistry, mechanics, natural philosophy, and otherwise accomplishments.

These remarks emanated from the society just then (1812) firmly establishing itself, and since become so conspicuous in the annals of practical science. John Smeaton was one of the most eminent among those self-educated men, so well described in the Preface to his "Reports," and to whom the Society of Civil Engineers pointed with well-founded pride, as an example of what may be accomplished by individual exertion. Vast natural talent, with strong predilection for his future profession, grew with his growth; but encouragement had been denied. Excepting, as it were, from the trammels of the law and its study, we find him, at the comparatively early age of twenty-six, in correspondence with the Royal Society of London, in a communication dated Farnham-courthouse, April 16, 1750, "On Improvements in the Mariner's Compass;" and so frequent and important were his subsequent papers, that in 1753 he was elected a *fellow of that society*; and in 1759 honoured with an unanimous vote, with their gold medal, for his paper entitled "An Experimental Inquiry concerning the natural Power of Water and Wind to turn Mills and other Machines depending on Circular Motion." With these preliminary paragraphs, necessary to a conception of the rank in science to which Mr. Smeaton had raised himself, we may proceed to mention his nearly first great practical work, the Eddystone Lighthouse. This beacon, so essential to

security in navigating the coasts of Devon and Cornwall, and particularly in entering Plymouth Sound and Harbour, one of the great depots of British maritime power, had been twice erected and destroyed; the first structure in 1696, which was blown down during the storm of 1703, the six persons who were therein perishing at the time, Mr. Winstanley, the engineer and architect of the building, being of the number. In 1706 an Act of Parliament was passed for re-establishing the lighthouse, the corporation of Trinity House having power to lease the undertaking at their discretion; the inducement to the large expenditure of capital required upon such occasions being a revenue arising from a toll or bar, according to tonnage, imposed upon all vessels frequenting the coast. In the present case the lease for 99 years was Captain Lovett, who, singularly enough, selected as engineer Mr. John Rudyard, a silk mercer in considerable practice in Ludgate-hill. Smeaton, speaking of him, says, "It does not appear that Mr. Rudyard was bred to any mechanical business or scientific pursuit, nor do we find that in any other instance he had distinguished himself by any mechanical performance before or after; yet this is no proof but that he might have made these kind of subjects his private amusements; and it is indeed true that a natural genius, with very slender experience, will go further in design than experience alone is capable of. However, Mr. Rudyard's want of personal opportunities or practice was in a degree assisted by Mr. Smith and Mr. Norcutt, both silversmiths from the king's yard at Woolwich, who worked with him during the whole time he was building the lighthouse. It is not very material now in what way this gentleman became qualified for the execution of this work; it is sufficient that he directed the performance thereof in a masterly manner. He saw the errors in the former building and avoided them; instead of a polygon, he chose a circle for the outline, and carried up the elevation in that form. He seems to have adopted ideas the very reverse of his predecessor by rejecting all unwieldy ornaments at the top, such as an open gallery, and projecting cranes, contrivances more for ornament and pleasure than use; he saw that however beautiful ornaments may be in themselves, yet when they are improperly applied, or out of place, by affecting to show a taste, they betray ignorance of its first principle, *judgment*; for whatever deviates from propriety is erroneous, and at best insipid." These observations are valuable, as proving most clearly the state of science, and the anomalous condition of its professors, a hundred and thirty years since; Smeaton saw in the self-taught engineer Rudyard, a reflection of his own conceptions and powers, and not only defended but lauded the effort of one of the early pioneers in engineering and building art, the single effort of a silk mercer, in daring and accomplishing a novel and most difficult work! Upon the whole Rudyard's lighthouse

is described by Smeaton as a piece of ship-work, yet of elegant proportions, and in which the best principles of construction were accurately observed. Comparing it with Winstanley's building, and referring to the plans and details, he says:—"A comparison of these two buildings affords a great and useful lesson to future engineers. We are sure such a building as Mr. Winstanley's was not capable of resisting the utmost fury of the sea, because in four years it was totally swept away; but Mr. Rudyard's building had sustained innumerable attacks of that element, in all its fury, for forty-six years, and was then destroyed not by water, but by fire, an enemy scarcely calculated upon or guarded against." The quantity of materials expended in the construction were 500 tons of stone for the basement, and 1,200 tons of timber for the superstructure; 80 tons of iron, 35 tons of lead; and of treails, screws, and rock bolts 2,500 each. Rudyard's lighthouse was burnt on the 2nd day of December, 1755; the fire was supposed to have originated in the lantern, burning downwards to the basement; upon this occasion the three light-keepers were rescued, one of them dying shortly after from severe injuries received during the conflagration.

At this period the representatives of the original lessee of the Eddystone, Captain Lovett, had a remainder of half a century in a most beneficial property, and they bestowed themselves with energy in the matter of re-establishing the lighthouse. Engineering being at a low ebb, the main difficulty lay in procuring an efficient person to plan and conduct such a work. Under these circumstances, Mr. Weston, the principal proprietor, decided upon applying to the Earl of Maclesfield, then President of the Royal Society, for advice and assistance. The reply of that nobleman is authenticated to have been given in these words: "There is one of our body whom I can venture to recommend; yet the most material part of what I know of him is his having, within the compass of the last seven years, recommended himself to the society by the communication of several mechanical inventions and improvements; and though he at first made it his business to execute things in the instrument way, without ever having been bred to the trade, the merit of his performances has occasioned his association with us. Further, for about three years past, having found the business of a philosophical instrument maker not likely to afford an adequate living, he has wholly applied himself to such branches of mechanics as you appear to want. Mr. Smeaton, the individual I allude to, is now somewhere in Scotland, or the North of England, engaged in this way." The Earl concluded this recommendation by saying—"I have never known Mr. Smeaton to undertake any thing but what he completed to the satisfaction of those who employed him; and you may rely upon it that when the business you have in hand is laid to him, he will not undertake it unless he clearly sees himself capable of performing it.



RUINS OF THE KASR, OR PALACE, AT BABYLON.

(Referred to and described in "Lectures on Architecture," &c., p. 493.)